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# STEM WORKFORCE PIPELINE

**DELORES ETTER**

**SOUTHERN METHODIST UNIVERSITY**

**07/30/2013**
**Final Report**



**AIR FORCE RESEARCH LABORATORY**
**AF OFFICE OF SCIENTIFIC RESEARCH (AFOSR)/RSP**
**ARLINGTON, VIRGINIA 22203**
**AIR FORCE MATERIEL COMMAND**

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Etter, Delores M.
Groark, Lindsey G.

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Caruth Institute for Engineering Education
Southern Methodist University
3145 Dyer Street, Suite 253
Dallas, TX 75205

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The STEM-Works website was created to provide DoD personnel and other users around the world with access to high-quality, engaging science, technology, engineering, and mathematics (STEM) content to aid in advocating STEM content and skills to students. During this project, Southern Methodist University's (SMU) Caruth Institute for Engineering Education worked closely with Viget Labs, a web-development company, to design, build and evolve the STEM-Works website (located at www.STEM-Works.com). Using metrics collected through Google Analytics as well as feedback from teachers, the SMU team continued to add impactful resources to this website and identified new content types and functionality that would improve user experience. Over the duration of this grant, the STEM-Works website was updated on a weekly basis and currently includes over 3,000 pieces of content easily accessible by the broad STEM community. This effort significantly improved STEM advocates' access to high-quality content that can be used to interest students in STEM content, skills, and careers. Since inception in February 2011, the STEM-Works website has welcomed 66,961 visitors with over one-third of those visits occurring between January and April of 2013.

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## Abstract

The STEM-Works website was created to provide Department of Defense (DoD) personnel and other users around the world with access to high-quality, engaging science, technology, engineering, and mathematics (STEM) content to aid in advocating STEM content and skills to students. During this project, Southern Methodist University's (SMU) Caruth Institute for Engineering Education worked closely with Viget Labs, a web-development company, to design, build and evolve the STEM-Works website (located at www.STEM-Works.com). Using metrics collected through Google Analytics as well as feedback from teachers, the SMU team continued to add impactful resources to this website and identified new content types and functionality that would improve user experience. Over the duration of this grant, the STEM-Works website was updated on a weekly basis and currently includes over 3,000 pieces of content easily accessible by the broad STEM community. This effort significantly improved STEM advocates' access to high-quality content that can be used to interest students in STEM content, skills, and careers. Between its inception in February 2011 and the end of April 2013, the STEM-Works website welcomed 66,961 visitors with over one-third of those visits occurring between January and April of 2013. The number of visitors to the website continues to grow with over 7,500 visitors coming to the website during the last month of this grant (April 2013).

## Program Overview

The STEM-Works website was developed as a tool to support science, technology, engineering, and mathematics (STEM) advocates around the world. Building on the quality STEM content available on the internet, the STEM-Works website serves as a one-stop repository of resources for advocates including informational articles, lesson plans, activities, and geographic-specific content. This website reduces the amount of time that these advocates must spend searching for engaging content and facilitates these users' efforts to promote STEM skills and content to students.

## Content Types

The STEM-Works website includes a variety of engaging content related to various STEM subjects. Rather that organizing content by subject disciplines such as Computer Science or Electrical Engineering, the STEM-Works website was divided using subjects with names that would more closely relate to areas that would interest middle schools students. These subjects provide the framework for the entire STEM-Works website. All content included on the STEM-Works website is carefully screened by the SMU STEM team prior to adding it to the website. In order to be included on the STEM-Works website, all content must have substance related to STEM and be deemed age-appropriate for middle-school students.

### Subjects

The information contained on the website is divided into STEM-related subjects. These subjects provide the framework for audience members to quickly access information of interest while still presenting a wide range of content. The main subjects, or "super subjects," divide the breadth of content into manageable components. The super subjects on the website are:

- Crime Scene Investigation (CSI)
- Extreme Weather
- Medical Innovations
- Robotics
- Space
- The Animal Kingdom
- Under the Sea
- Video Games
- Wind Energy
- Other STEM Subjects

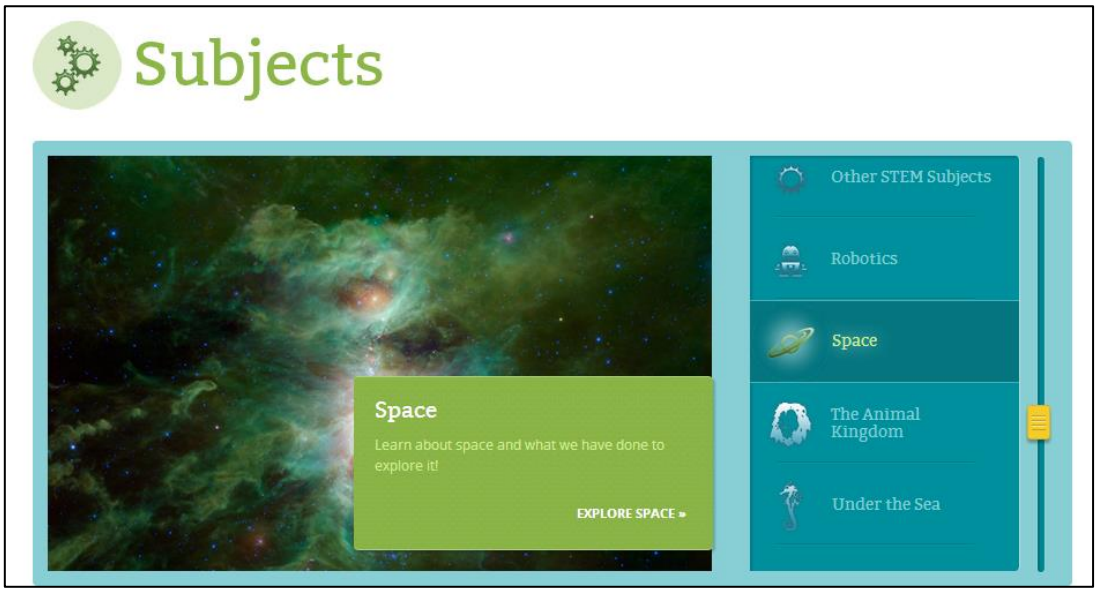



**Figure 1:** Screenshot of the Subjects landing page carousel on the STEM-Works website

Component Subjects: Although super subjects organize the website's information into manageable components, these subjects are intentionally broad to allow a wide variety of content to be added to the website. To facilitate greater ease of access to content of interest, the super subjects are further broken down into "component subjects." These component subjects allow the audience to access more specific information within the broad subject matter. For example, the Medical Innovations super subject includes the component subjects Prosthetics, Genetics and The Mind and Body. These component subjects enhance the usability of the website and cater to the variability of audiences.

## Locations

While the subjects on the website provide resources to learn about and interact with information about a variety of STEM subjects, the Locations section provides geographical resources to audience members from around the country. People from 29 different cities around the U.S. can visit the Locations section to learn about STEM-related Places to Go, Groups, and Events in their area. While the STEM-Works website empowers a broad community with information and activities, the Location section serves to build local communities from coast to coast.


**Figure 2:** Screenshot of the Locations landing page map on the STEM-Works website

Places to Go: The Places to Go section is unique to each community listed on the Locations page and includes a variety of STEM-related museums, organizations, and companies that people can visit in their local communities to learn more about STEM. From museums, to gardens, to planetariums and more, Places to Go mobilizes people to explore the STEM resources offered by their cities. Examples of Places to Go include:

- *LEGOLAND Discovery Center in Dallas-Ft. Worth, TX*: The LEGOLAND Discovery Center Dallas/Fort Worth is a LEGO themed kids attraction made up of a series of interactive features to engage children in creative and physical activities. (http://bit.ly/13V7B3f)
- *International Spy Museum in Washington, DC:* Kids can take on the role of intelligence officers and learn and practice forensics skills, like code-breaking, identifying spies in disguise, and hunting down nuclear weapons on the black market. (http://bit.ly/11FdSRD)
- *Challenger Learning Center of Colorado in Colorado Springs, CO*: At the Challenger Learning Center, students can learn all about the space program and even go on a simulated space mission of their own. (http://bit.ly/192IxKY)

Groups: The Groups section seeks to unite people with similar STEM interests in each community. These groups include boy/girl scout troupes, science clubs, advisory boards and more. By visiting the Groups section, visitors can find opportunities to engage with those who share similar interests. Examples of Groups include:

- *Clever Kids: Intel Computer Club in Seattle, WA*: This club provides multiple forms of activities, from movie making to robot programming, and teaches kids to become fluent in computer and electronic skills. (http://bit.ly/13V8w3R)
- *Stargazing Program in Honolulu, HI*: People of all ages are invited to this free club and gain access to powerful telescopes to learn more about the night sky. (http://bit.ly/117IGLd)

- *Wasatch Gem Society in Salt Lake City, UT*: The Wasatch Gem Society offers a unique opportunity for kids ages 12-17 to learn about gem material, minerals, and fossils. (http://bit.ly/1a1ufLW)

Events: The Events section includes information for STEM-related events occurring in each location. Happenings such as classes, competitions, museum exhibits and festivals can all be found in this section and range from short events to week-long camp opportunities. Examples of Events include:

- *Summer Solstice Celebration in Portland, OR*: Astronomers celebrate the beginning of summer with a free Star Party. (http://bit.ly/15UDM40)
- *Mad Science in Seattle, WA*: This camp teaches students ages 6-14 the way of scientific inquiry. (http://bit.ly/12DS8sG)
- *ZZZoofari Slumber in Nashville, TN*: Learn about the various stars, get involved in various activities, and camp under the stars with family and friends at the Nashville Zoo at Grassmere. (http://bit.ly/11tDnBl)

### Articles

The Articles section of the website includes informative articles and videos related to each of the site's subjects. This section ranges in type of content but primarily includes sourced content found on other websites on the internet. The content included in this area primarily includes informational articles such as news stories and introductory write-ups covering a variety of topics related to each of the super subjects. The videos included in this section provide how-to videos, informational videos, as well as newscasts that highlight interesting topics related to the super subjects. Content in this section ranges from introductory to information to advanced concepts. Examples of Articles include:

- *Middle School Kids Making Video Games* (Video Game Subject): Kids step out of their computer classes and into the real world of game creation. (http://bit.ly/11Ugo2n)
- *Exercise May Preserve Brain Better Than Games* (Medical Innovations Subject): New research shows that exercise might actually help protect the brain more than cognitive games that challenge the brain. (http://bit.ly/19mI20L)
- *How a Hurricane Is Born – The Science of Superstorms* (Extreme Weather Subject): This video, published by the BBC, follows a hurricane all the way back to its roots in sub-Saharan Africa. (http://bit.ly/14v5s0g)

### Activities

The Activities section provides opportunities for the audience to interact with the subjects in a hand's on fashion. While the Articles section supplies access to information, the Activities section puts that information into practice. This section also includes primarily sourced content, and each activity corresponds directly with one of the featured subjects. These activities target a wide range of ages and skill levels and can be conducted at home, in the classroom, or in other group settings. Whether building a prosthetic leg using everyday materials or learning about weather using a homemade barometer, audience members can increase their knowledge of the super subjects in an engaging way with our Activities. Examples of Activities include:

- *Building Beaches* (Under the Sea Subject): Students learn how beaches and shorelines are created through this hands-on activity. (http://bit.ly/192GjuS)

- *Create a DNA Fingerprint* (CSI Subject): Students use biometrics principles to make a DNA fingerprint. (http://bit.ly/19mKHaU)
- *Finding True North* (Space Subject): Students orient themselves in space by learning how to find the different directions. (http://bit.ly/11UiP4T)
- *Hovercraft* (Robotics Subject): Students learn how to make a simple hovercraft at home. (http://bit.ly/192HzOJ)

### Cool Jobs

This area highlights a wide array of STEM careers for kids and provides cameos of STEM professional across the United States. The "Cool Jobs" feature was added to the STEM-Works website to advocate a variety of STEM careers to kids and to demonstrate the diversity of opportunities available for people who are interested and proficient in STEM. The development of this new area as well as the process of interviewing 50 diverse STEM professionals was funded by an Office of Naval Research (ONR) grant. Examples of Cool Jobs include:

- *Katrina McCauley, Zookeeper with the Columbus Zoo* (Animal Kingdom Subject): Katrina McCauley entered the field of zookeeping and has been building her relationship with Colo, the oldest gorilla in a zoo, ever since. (http://bit.ly/ZnW0W4)
- *Dr. Josh Wurman and Dr. Karen Kosiba, Storm Chasers* (Extreme Weather Subject): Dr. Wurman and Dr. Kosiba discuss what life is really like as meteorologists and storm chasers. (http://bit.ly/Q0QE2S)
- *Carlie Zumwalt, Aerospace Engineer with NASA* (Space Subject): Carlie Zumwalt works day after day to help land a human on Mars. (http://bit.ly/WSidyY)

### STEM Advocacy

This section includes materials and ideas to assist grown-ups in advocating STEM to K-16 students. In this relatively new area of the website, content is organized similar to the Cool Jobs content by the following age groups: Elementary School (K-5$^{th}$ Grade); Middle School (6$^{th}$-8$^{th}$ Grades); High School (9$^{th}$-12$^{th}$ Grades); and Undergraduate. On the Advocacy landing page, users have the option of selecting one of these age groups and will then be directed to a page organized with content and resources with information on how to successfully advocate to that specific group of students. These materials include general resources and materials as well as recommendations from current science and math teachers. This new area was funded by the same ONR grant as the Cool Jobs section. This section includes the following three types of content.

Publications: The publications section includes a variety of different scholarly works as well as magazines and newsletter with information related to STEM. A few of these scholarly works include the *Rising against the Gathering Storm* reports and the 2012 report released by the US Department of Commerce. This section also includes magazines, journals, newsletter and articles geared towards adults and relating to STEM. Examples of these types of publications available on STEM-Works include *Science New: Magazine of the Society for Science and the Public* as well as the *National Geographic* newsletter. Finally, this section also includes magazines and newsletters geared toward kids and families. Two of these newsletters included on the site are *Science News for Kids* and *Neuroscience for Kids Newsletter*. Examples of Publications include:

- *Why Science Majors Change Their Minds (It's Just So Darn Hard)*: This article, published by the New York Times in November of 2011, explores the reasons why so

many students are switching from STEM majors to "softer" majors. (http://bit.ly/1a1vCu4)

- *White House – Women in STEM*: The Women in STEM page produced by the Office of Science and Technology Policy and the White House Council on Women and Girls offers Facts Sheets, Reports, News, Speeches, Events and Resources all relating to women in STEM. (http://bit.ly/14va8Do)
- *2012 Bayer Report - STEM Education, Science Literacy, and the Innovation Workforce in America*: In compiling this document, Bayer has identified key intersections of thought, belief and concern among diverse stakeholders. (http://bit.ly/11tEoJF)

Lesson Plans: In order to engage kids in STEM pursuits, it is often helpful to have lessons plans or curriculum geared toward improving inquiry skills or highlighting specific STEM content. This section provides exactly that type of resource. In addition to the Activities section on the websites, the Lesson Plans section provides educators and advocates with background information on activities and provides the framework for the content and skills promoted through the activity. Examples of Lesson Plans include:

- *Diary of a Worm Lesson Plan*: This lesson plan introduces students to different types of worms and their unique characteristics. (http://bit.ly/11UmyiV)
- *Technology at Work Curriculum*: Middle school students gain hands-on experience with technology at work through a variety of tech-savvy lessons covering topics from computer science to reading satellite images. (http://bit.ly/1bt5bLQ)
- *Crime Scene Investigation Foundations of Law Integrated Unit*: In this unit, students integrate math, science, and language arts into the study of forensic science to solve a murder that has occurred at the school. (http://bit.ly/13VbXr3)

Virtual Field Trips: Following an email request we received from one of our website users who lives in a rural area, we decided to find a way to introduce kids who may not have the means or opportunity to travel to major cities to take virtual field trips. These virtual field trips are all virtual experiences that classes, families or individual students can investigate without ever leaving their homes or classrooms. All of these experiences are free and offer students and advocates the opportunity to experience something that may have previously been out of their reach. Examples of Virtual Field Trips include:

- *Remotely Visit the Monterey Bay Aquarium* (Under the Sea Subject): The Monterey Bay Aquarium provides remote access to live webcams of many of their exhibits, and it also provides access to informative podcasts and videos. (http://bit.ly/1bt4dza)
- *Virtual Mission: International Space Station Live* (Space Subject): Students travel to the edge of the universe by exploring live feeds from the International Space Station. (http://bit.ly/17FnYq4)
- *Grand Canyon Exploration* (Other STEM Subject): Students can explore the Grand Canyon and all of its geological diversity through this unique online experience. (http://bit.ly/11Uo5p0)

## STEM-Works Website Development

The STEM-Works website was developed utilizing a phased approach. This approach allowed for informed, periodic updates to the structure, design, and backend framework of the STEM-

Works website. Each of these phases covered approximately one year of the grant. Below is a description of the work completed during each of these phases.

### Phase I: Beta Launch (February 2011)

The first phase of the STEM-Works website development was primarily focused on building the framework for the site. In order to do this we worked in close coordination with Viget, our web development team, throughout this phase. A significant amount of backend development work on the website, as well as design work was completed during this phase to develop a "brand" for the website and ensure that the site was easily navigable by users. The information garnered from the development portion of this phase as well as the feedback we received through surveys and user experience research was pivotal as we embarked on the following two phases. This initial phase was launched with three subjects (Robotics, Forensics, and Wind Energy) and four geographic locations (Boston, MA; Washington, DC; Dallas, TX; Albuquerque, NM).

### Phase II: February 2012

Following the launch of Phase I, we focused our attention on adding additional content (both subjects and locations) as well as identifying ways that the website could be updated to improve user experience and promote positive engagement by visitors. These updates primarily fell into four categories: Navigation, New Content; Content Management System (CMS) Updates; and Increased User Engagement Opportunities. Each of these updates is described below.

Navigation: During this phase, the emphasis in terms of navigation updates was placed on increasing the amount of content that users were introduced to before diving into the individual content pages. In order to do this, the content carousels on the Article, Activities and Cool Jobs pages were update to feature five featured pieces of content per subject. Additionally, the subject infrastructure was expanded to include "Super Subjects" and related "Component Subjects" to provide users with easier access to the content that most interested them. Finally, the team developed and incorporated an announcement banner that could be used to display important events or updates to the websites in a

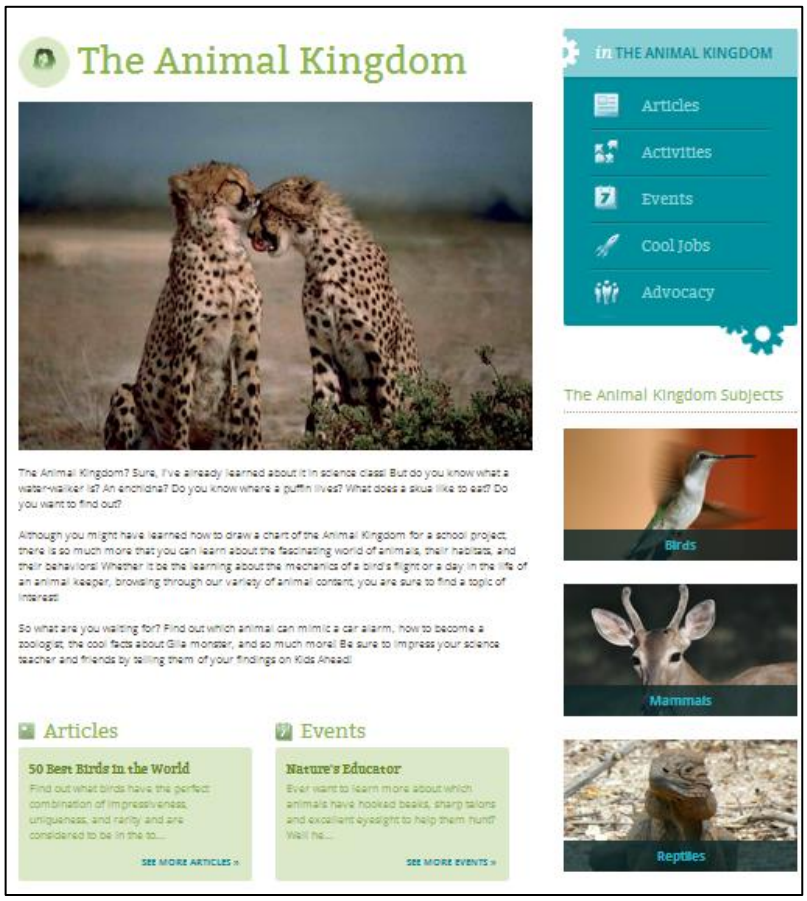



**Figure 3:** Screenshot of new subject page showcasing Component Subject in the right sidebar.

prominent location on the homepage. All of these updates further improved user experience and assisted users in accessing the content they were most interested in while also sharing content that they may not be specifically looking for but also have an interest in learning more about.

New Content: To further expand the content included on the STEM-Works website, the SMU STEM team identified a new content area, titled "Cool Jobs," to feature interesting STEM careers. Thanks to a grant from the Office of Naval Research, the SMU STEM team worked with Viget to conceptualize and develop this new area for the website and launched the beginning of this content during Phase II. The SMU STEM team used this new content area to further expand the content available on the website, finding interviews, videos and professional cameos in existence on the internet and using this content as the starting point for this new area of the site.

Content Management System (CMS) Updates: In order to further improve the SMU STEM team's control of the website without the assistance and time of the web development team, a significant effort was afforded to evolve the CMS. These updates included the ability to add new subjects and related collateral as well as the ability to modify the static pages with information about the program and the team. These updates gave the SMU team much greater control over the STEM-Works website and allowed the Viget team more time to focus on front-end development and updates to further evolve the website.

Increased User Engagement Opportunities: As the social media engagement for the STEM-Works program grew, the team decided to incorporate easier ways for users to share the STEM-Works website with their respective social media communities. To do this on multiple levels, the team decided to add social media "buttons" on the footer of every page of the website and also incorporated an all-inclusive "add this" icon to each individual piece of content. These two different ways of sharing the website allow users to share the website as a whole or specific content they find interesting which further extended the reach of this site.


**Figure 4:** Screenshot of social media buttons in footer of the STEM-Works website.

### Phase III: November 2012 – April 2013

Phase three of the STEM-Works website development built on the updates that had been made during the previous two phases. Building on feedback from users and STEM community members, the focus of this phase was to further improve ease of use for the website and also to expand outreach efforts aimed at increasing the number of potential users who were aware of the site. One of the primary goals of this phase was to ensure that the website and related content management system was robust and flexible enough to allow the SMU STEM team to continue evolving the content of the website after the completion of this grant. This goal was successfully accomplished and the team has continued to update the websites following grant completion. Below is a brief description of the major efforts during this phase.

Navigation: Responding to feedback from many community members, the SMU STEM Team worked closely with the web development team at Viget to update the design of the website to make it more visually appealing. By brightening many of the colors and building in dynamic animations and backgrounds, this update helped to create a more visually attractive website that appeals to a broader base of users. In addition to these aesthetic updates, the team also built in increased navigation functionality including content tagging and a new subject "permabar." These two functionality upgrades provide users with easy access to subjects and content from any page on the website and reduce the need for users to deep-dive into content to find what they are looking for. These updates also promote greater engagement with the website and help users find interesting content in subjects that they may not have otherwise considered.

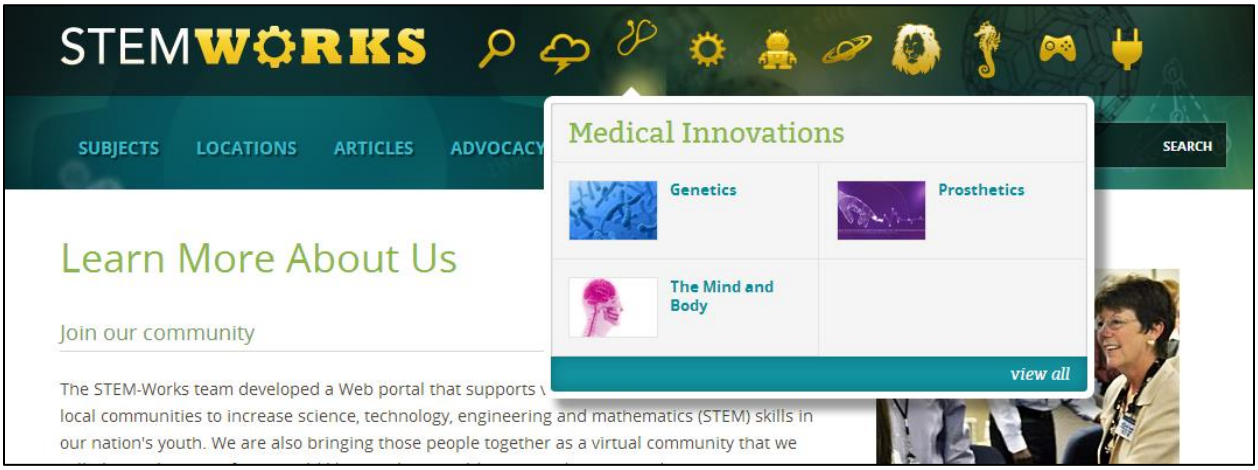



**Figure 5:** Screenshot of the new subject permabar on STEM-Works

New Content: Further expanding the content available through the STEM-Works website, during this phase the team also developed and implemented a new STEM Advocacy area of the website. The development of this area was paid for from the same Office of Naval Research grant that build the Cool Jobs section. This new section provides anecdotal information about the importance of STEM Advocacy, best practices for advocating STEM, as well as resources to facilitate this effort.

Increased User Engagement Opportunities: Building on the advances made during Phase II, significant effort was put on building robust outreach efforts using various social media outlets. During this phase, the SMU STEM Outreach Director started posting content to Facebook, Twitter and Pinterest on a daily basis and engaging with users through these platforms. During this phase, the number of followers on these sites grew significantly. (For additional explanation of the outreach effort within this grant, please see the Outreach section of this report.)

## Community Engagement on the Website

In order to engage users on the STEM-Works websites, we placed an emphasis on avenues for users to provide us with feedback, recommendations and to share the content with their community via social media channels and email.

### Recommendations for Content

On every page of the STEM-Works website, there is a form where users can submit a recommendation related to the website as a whole or related to specific content. These forms provide users with an easy way to contact the SMU STEM team and give users a voice in the direction of the website and content included. Due to a request received from the STEM-Works user community, the team added the Virtual Field Trip area to the website. This interaction with the community has been a very positive aspect of this program.

## Usage & Impact

Usage of the STEM-Works website is tracked utilizing Google Analytics code that is embedded on every page of the website. This code provides us with detailed information related to usage of the site which enabled us to update the website in the most effective and impactful ways over the duration of this effort. Below is an overview of some of the analytic data over the course of this grant including graphs charting development over the last three years. Additional usage and impact data can be found in the STEM-Works Fact Sheet in Appendix A.

### Audience

Within Google Analytics, we tracked information related to the audience or users who visited the STEM-Works site. This information was all general in nature and did not include anything that could identify individuals. Below are some of the data points that were collected along with an explanation of what this data meant for the site.

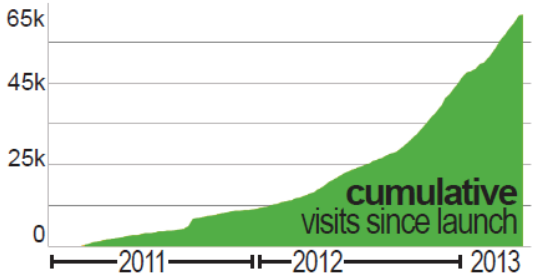



**Figure 6:** Chart with the cumulative visits to the STEM-Works website since launch in February 2011.

Time on Site: In order to determine the level of engagement each user had with the site, Google Analytics collects data about the amount of time users spend on the STEM-Works site. The greater the amount of time users spent on the website, the higher their engagement with the website. On average, users spent over two minutes per visit on the STEM-Works website which is very positive considering that most content on the website directs users to external webpages with the individual pieces of content.

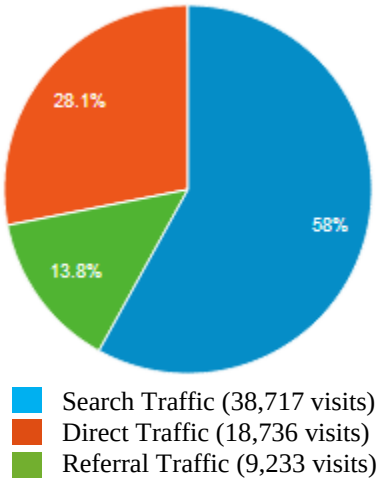
Pages Viewed and Pages per Visit: Closely related the to the amount of time user spent on the website, Google Analytics also collects data related to the number of pages users viewed during each visit to the STEM-Works website. Since inception, the STEM-Works site averaged 3.09 pages per user per visit and users viewed a total of 206,785 pages.

Location: In order to ensure that the most active geographic regions were represented by locations on the STEM-Works website, the SMU STEM team analyzed information on which locations included the most active users. As additional locations were added to the site, these analytics were carefully considered. Since inception, the STEM-Works website welcomed visitors from all 50 United States and the District of Columbia as well as 165 countries from around the world.

Language: In addition to geographic location, Google Analytics also tracks the language that users view the STEM-Works website in. Due to significant updates in web translation, this became an interesting analytic in order to see the international reach of the website. Since inception, the STEM-Works website was viewed in 97 different languages.

## Traffic Sources

Visitors found the STEM-Works websites through a variety of methods. Through Google Analytics, we tracked how users entered the site and used this data to inform our outreach strategies. Additionally, this information assisted us in understanding how our connections with other community members and participation in regional and national events impacted website usage. The three overarching sources are: search traffic; referral traffic; and direct traffic.




Search traffic includes all traffic that was directed to the website from search engines such as Google, Bing and Yahoo. This source included over half of the visitors to the STEM-Works website. Search engine optimization that was completed by the web development team promoted keywords searches that direct internet users to our site when they searched for terms related to the content on our website.

Referral traffic includes traffic that was directed to the website from other websites that have a link to our website on one of their pages. The STEM-Works website was listed as a great STEM resource on many other STEM education websites and blog which promoted much of this referral traffic. Additionally, social media referrals were included in this source so as our social media presence grew, the number of visitors who found our site through referrals also grew.

Direct traffic includes traffic that typed in the www.STEM-Works.com address. Many of these users were community members who were familiar with us from face-to-face engagement during conferences and events as well as users who were introduced to our sites through print collateral that included the website's URL. This source also includes users who bookmarked the website and returned at a later date.

## Popular Content

Another important way that we used Google Analytics was to track popular content that had high numbers of user interaction and views. Through this analysis, we were able to identify types of content that the community was interested in and continue to add content that had a similar format or focus. Removing general pages such as the homepage and subject landing pages, below is a list of the ten most popular pieces of content since the STEM-Works website was launched. It is important to note that because only three subjects were included in the initial launch of the website, most of the content listed below has been active for much longer than newer content.

1. Crash Scene Investigation (Crime Scene Investigation Activity): 6,458 views
2. Interactive Investigator (Forensics Activity): 5,165 views

3. Cops and Robbers – Solve the Crime Game (Forensics Activity): 3,136 views
4. Puff-Mobile (Wind Energy Activity): 2,888 views
5. Two Forks, Idaho: A Science Mystery Game (Forensics Activity): 2,804 views
6. Crime Scene: The Case of the Barefoot Burglar (Forensics Activity): 2,423 views
7. Build Your Own Robot Arm (Robotics Activity): 2,407 views
8. High School Forensics (Forensics Activity): 2,405 views
9. The Writing on the Wall (Forensics Activity): 1,879 views
10. Bones and the Badge (Forensics Activity): 1,830 views

## OUTREACH

In order to increase public awareness of these new initiatives, the promotional activities surrounding the STEM-Works website was, and continue to be, imperative. A variety of outreach methods have been utilized, including social media, conferences/events, collaboration with the SMU CSI program and a recently launched STEM-Works blog.

### Social Media

Using existing Facebook, Twitter and Pinterest pages created for the STEM-Works websites, content from across this website has been shared with a broad community. This interaction with our social media community greatly increased the number of potential visitors that were introduced to the content on STEM-Works. Additionally, over the last year, our social media community has grown extensively which allows us to reaching a continuously growing number of potential users.

### Conferences & Events

Over the course of this effort, the SMU STEM team participated in numerous conferences and exhibits to spread the word about the STEM-Works resource to the broad STEM community. Below is a list of the team's engagement at these regional and national events.

- 2011:
  - Presented during the American Society of Mechanical Engineering (ASME) Inspire Innovation Workshop: Engineering in the Classroom in Dallas, TX
  - Hosted an exhibit at The Military Child Education Coalition (MCEC) 2011 Annual Conference in Nashville, TN
  - Participation in and hosted a workshop at the KIPP Math and Science Retreat in Houston, TX
  - Hosted an exhibit at the Texas Science & Engineering Festival in Austin, TX
  - Hosted an exhibit at the FIRST LEGO League Regional Competition in Dallas, TX
- 2012
  - Hosted an exhibit with hands-on activities at the National Science & Engineering Festival in Washington, DC
  - Hosted three workshops at The Military Child Education Coalition (MCEC) 2012 Annual Conference in Grapevine, TX
- 2013
  - Hosted a workshop for staff during the Midvale Boys & Girls Club All-Staff Meeting in Midvale, UT

- Hosted a workshop and staffed an exhibit at the National Science Teachers Association (NSTA) Annual Conference in San Antonio, TX

### Connection with CSI Camp programs

The STEM-Works website was also used to share information about the SMU Crime Scene Investigation (CSI) Camp program through videos and articles as well as through engaging hands-on activities conducted at the camp. By sharing this content on the STEM-Works website, users around the world were introduced to novel content used in the CSI Camps. Including this content on the STEM-Works websites also provided the families of campers with insight into their campers' experience at camp as well as additional activities and articles that the families could review and complete together.

### Blog (launched May 1)

On May 1, 2013, the STEM-Works blog (at http://stem-worksblog.com) was launched to further expand the reach of the STEM-Works website. This blog provides an outlet for the education community to interact and share their best practices, experiences with the STEM-Works content, and other STEM-related knowledge or perspective. This blog is managed and facilitated by the SMU team and all guest blog posts are moderated and reviewed by the SMU team. In addition to expanding and showcasing content shared through the STEM-Works website, this blog also serves to share information and updates related to the SMU Crime Scene Investigation (CSI) Camp program.

## Caruth Institute STEM-Works Team

In addition to the leadership from the PI, Dr. Delores Etter, the STEM-Works website was developed with the assistance of a strong team of professionals with diverse skill sets and interests. Below is a short overview describing the team members' roles in this effort.

### Program Director (Lindsey Gates Groark)

The Caruth Institute's STEM Program Director provided the day-to-day and strategic leadership for the STEM-Works websites. She managed the team responsible for content development and was the primary point-of-content from SMU who coordinated efforts with Viget, the web development company. She was also responsible for engaging with the broad STEM community and identifying updates to include in each of the phases in order to continue evolving the STEM-Works website.

### Outreach & Social Media Directors (Arrin Bristow & Danielle Caldwell)

The Outreach and Social Media Directors were responsible for developing and implementing the outreach plan used to spread word to the broad STEM community about the new STEM-Works resource. In addition to posting content on social media avenues and coordinating attendance at national STEM conferences, these team members provided strategic communications recommendations in order to attract new users to the STEM-Works website. The outreach efforts conducted through this grant significantly increased the reach of this website.

### Research Associates (Danielle Caldwell & Shanna Johnson)

Two Research Associates were brought onto the team during Phase III to assist with the development of the Cool Jobs and Advocacy sections of the website. In addition to sourcing

content and conducting interviews, these Associates also assisted Research Assistants in identifying content for new and existing subjects and locations on the website.

### Research Assistants

The primary group of staff working on the STEM-Works websites was undergraduate Research Assistants. These students were primarily engineering students who held a particular interest in promoting the subjects they are interested in with younger kids. Utilizing undergraduate students to identify engaging content was particularly useful throughout this grant and we believe that it promoted the development of a site that would be of use to many advocates and their students. Additionally, by employing between three and six students each semester to work on content development, the website grew significantly over the three year grant period.

### Viget (Web Development Company)

Over the duration of this grant, the SMU team worked closely with Viget to provide the technical, web development expertise needed to bring our ideas to fruition. Building on their vast experience with high-profile clients around the world, Viget provided expert advice and assisted in developing a website that is both attractive and functional.

## Website Sustainability

Due to the framework that has been developed through this grant as well as the depth and breadth of content already shared on the STEM-Works websites, the STEM-Works website is quite sustainable. With the assistance of undergraduate students from SMU, we will continue to periodically audit existing content and add novel content to the ten subjects on the website. We are also working to build on our relationships with STEM leaders in many of the communities listed on the STEM-Works websites to invite STEM-Works ambassadors in each community to add new location-specific content to share with users. As a result of these efforts, we are committed to continue updating this website and ensure that its users have access to this special content. The funding for this sustainment is a part of the PI's base funding for the Caruth Institute of Engineering.

## Conclusion

The STEM-Works website is an important addition to the international STEM community and provides STEM advocates around the world with a one-stop shop to find engaging content to use in promoting STEM to students of any age. This website is a valuable resource for advocates ranging from educators to after-school program leaders to parents and provides these advocates with easy access to quality resources to facilitate them in their endeavors. This effort has had a significant impact reaching over 67,000 users in all 50 U.S. states and 197 countries around the world. The Caruth Institute is committed to ensuring that the website is updated and continues to provide unique resources to teachers, parents, and volunteers who are dedicated to sparking the enthusiasm of young people in STEM areas.

## Appendix A – STEM-Works Fact Sheet

# STEM WORKS Fact Sheet

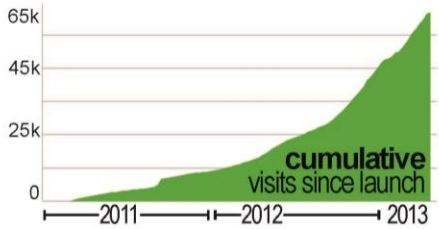
The STEM-Work website (at www. STEM-Works.com) was created with a grant from the Air Force Office of Scientific Research (AFOSR) and aims to provide grown-ups with engaging STEM content to use in advocating science, technology, engineering, and math (STEM) to youth.

## Website Usage (launch on February 14, 2011 through April 30, 2013)

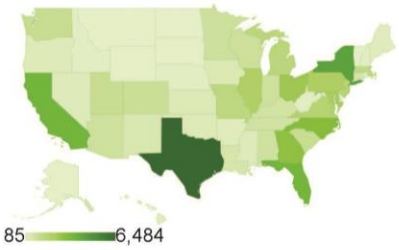
Usage and user activity on the STEM-Works website is tracked using Google Analytics. These analytics provide important insights that assist the STEM-Works team in identifying new content that may be of particular interest to users.

**66,961** unique visits

**206,785** pageviews




**650** users are registered on the site allowing them to make comments and rate content




**USERS** to the site have come from:
**165** countries in the world
**51** US states & DC
and have viewed the site in **97** languages

## Social Media Outreach

Outreach, particularly through social media, is an important aspect of this program. Through these outlets we are able to reach large numbers of potential users that would otherwise be unaware of the STEM-Works website. Since launching a presence on these venues and dedicating time each day to engage with the community, we have seen increasing growth in the community following us on these social media sites.

**160** Facebook likes

**2,830** Twitter followers

**173** Pinterest followers

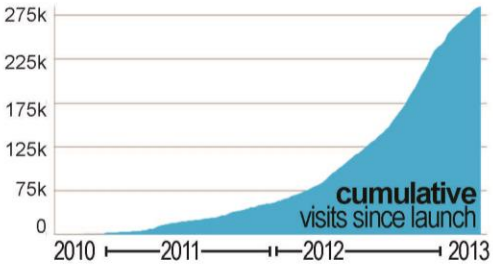
## KIDS AHEAD Companion Website

The Kids Ahead website (at www.KidsAhead.com) was created as a companion site for STEM-Works focused for an audience primarily consisting of middle school students. This website further extends the reach of the STEM-Works website by engaging youth from around the world in the content shared with grown-ups on STEM-Works.

**USERS** to the site have come from:
**180** countries in the world
**51** US states & DC

**277,454** unique visits

**563,158** pageviews




Caruth Institute for Engineering Education
SMU Lyle School of Engineering
3145 Dyer St., Suite 253 • Dallas, TX 75205
(214) 768-4262

# STEM WORKS Fact Sheet

## CONTENT

**3,333** individual pieces of content on the STEM-Works website

The STEM-Works website includes a variety of content aimed at engaging youth around STEM subjects. The website is oriented around subjects that, in many cases, are split into more specific component subjects. All content on the website is mapped directly to these subjects or geographic locations in the United States.

**10** Super Subjects with **28** Component Subjects

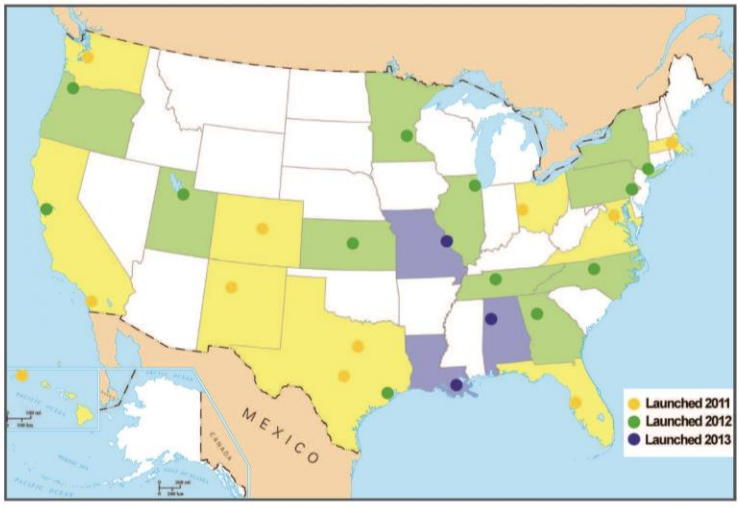
- **Crime Scene Investigation** includes: Biometrics and Forensics
- **Extreme Weather** includes: Earthquakes, Hurricanes, Tornados & Thunderstorms, and Tsunamis & Floods
- **Medical Innovations** includes: Genetics, Prosthetics, and The Mind & Body

**Other STEM Subjects**

- **Robotics**
- **Space** includes: Deep Space, Our Solar System, and Our Solar System
- **The Animal Kingdom** includes: Birds, Mammal, and Reptiles
- **Under the Sea** includes: Deep Sea Exploration, Middle Sea, and The Shallows
- **Video Game Development**
- **Wind Energy**

**Within these subjects the website includes:**

- **784** Articles & Videos
- **505** Activities
- **305** Cool Jobs
- **131** Advocate Resources (Publications, Lesson Plans, & Virtual Field Trips)




**29** Locations with geographic-specific content for local users

**230** Places to Go to learn and get hands-on opportunities with STEM

**218** Groups to engage with other local people around exciting STEM subjects

**1160** Events to attend to meet other people interested in similar STEM subjects

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